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The effectiveness of the strategy of analyzing the root causes in physics and Concurrent thinking among fourth scientific grade students

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Abstract:
The research aims to identify the effectiveness of the strategy of analyzing the root causes and concurrent thinking among fourth grade students Scientific The researchers adopted the experimental approach with experimental design for two equivalent groups, and the researchers chose randomly (secondary verses for girls) distributed over two divisions (A.B) has been selected Division (A) in a random manner to represent the control group, and in the same way was chosen Division (B) to represent the experimental group, the researcher was rewarded statistically between the members of the two groups in the following variables: (Chronological age calculated in months; , intelligence test Otis Lennon, and concurrent thinking), and the researchers identified the material from the physics book for the fourth grade of middle school and then formulated researchers behavioral goals as the number (205) behavioral goals representative of the six cognitive levels of Bloom"s classification in the cognitive field, as for the research tool has been researchers to build a tool for thinking where the first dimension included a scale (storage capacity), which consisted of (20) paragraph and the second dimension test (processing speed), which consisted of (20)The researchers used appropriate statistical means to extract the data, and the results showed the superiority of the experimental group over the control group, and in light of this, the researchers formulated a number of recommendations and proposals mentioned in the fourth chapter.
Keywords: *Root Causes Analysis Strategy, Concurrent or(Simultaneous)Thinking, Fourth Grade Scientific Students, Physics*

Chapter One: Definition of Research

First: Research Problem

The teaching of the basics of knowledge is one of the effective solutions to meet the challenges of the times, as the basic concepts and principles form a basis for understanding partial facts in various fields of science in general, the modern education process is no longer intended just to indoctrinate students as much knowledge and skills, but has exceeded that to become an integrated project to bring about a real radical transformation in the structure of their thinking and behavior to become more able to invest energies and concurrent-potential in areas of life, Since the assimilation of concepts is one of the pillars of real knowledge and its key, it is necessary that the education process is concerned with achieving understanding, and providing the learner with the thinking skills necessary to discover and innovate knowledge and achieve integration between different experiences on the basis of unity of knowledge and deepen the ability to think scientifically. Therefore, it is imperative for science teachers in general and physics teachers in particular to work on building students" thinking through the use of new methods that contribute to absorbing physical concepts and developing their thinking skills, especially with the shortcomings that often marred our educational methods and educational programs, and this is what previous educational studies and research such as (Al-Azawi, 2023) and what the researcher noticed through her field experience that extends for (9) years that there is a clear weakness in students" comprehension of physical concepts that It requires the capacity and speed of processing of information, which was reflected in their ability to collect, think and understand the topics deeply, so it has become necessary to follow new methods of teaching concepts that

keep pace with the spirit of the times such as modern teaching strategies, as it is no longer acceptable to adhere to strategies based on lecture, recitation and recitation just to get used to them and their ease because they are no longer sufficient to meet the requirements of the educational and educational process, and it has become important to know everything new in teaching, and put it into practice in the field of educational work, Where these strategies are the cornerstone to improve the educational process by adopting an approach that focuses on the needs of students and allows greater interaction between learners and teachers, and thus contributes to raising and achieving higher levels of achievement and thinking among students, and through the foregoing, the researcher identified the research problem with the following question:

(What is the effectiveness of the strategy of analyzing the root causes in the achievement of physics and concurrent thinking among fourth grade scientific students?)

Second: The importance of research

Scientific research is an important tool to understand the impact of teaching strategies on students" thinking patterns The importance of this research lies in studying the impact of the independent variable (root cause analysis strategy) on (concurrent thinking) in order to develop more effective teaching methods and problem-solving strategies that have emerged recently, including the strategy of analiyzing root causes, are important strategies that can be used in teaching most educational disciplines, including science in general and physics In particular, it is one of the complex materials in most of its topics presented, and you need to find real and accurate causes for the various phenomena that are not perceived by many students, and you need to use the logical analysis method in order to reach logical results that contribute to solving problems (Nelms, 2010, p. 45)

The strategy of analyzing the root causes is a pattern of strategies that aim to solve problems, as the strategy of analyzing the root causes aims to identify the main motives, and the root causes of problems, events and causative situations. For the problem, as this strategy enables students to have the skills of analytical accuracy of one problem and distinguish between important aspects (cause and effect) of the problem, as it is characterized by freedom in its application.(Al-Shuwaili et al., 2016:55)

One of the types of thinking that has received the attention of many researchers and educators is concurrent thinking, which was the goal behind this interest is to develop concurrent thinking, so that the individual is more able to face the problems that stand in his way in various walks of life, whether scientific, social, political or economic, as it helps greatly in developing the thinking of secondary school students and their abilities to keep pace with all current and future life changes, because students represent the first investment in developed countries Which works to invest the energies of its children, and then help them develop their lives in the advanced era they live, and that the sectors of society require leaders who possess multiple capabilities and skills through which they can manage their societies on their progress and development (Cole: 277: 2016).

Concurrent thinking is one of the important thinking patterns and helps to use brain capabilities better, and students gain sound foundations in thinking, and develop their abilities and skills, and it has become clear in light of the cognitive explosion and technological acceleration, and in light of the complexities of life that there is a weakness in the use of brain abilities in thinking, and keeping pace with life in light of the simple use of brain abilities and thinking abilities does not meet our needs and requirements within the challenges of contemporary life (Abdeen, 2020: 67)

The importance of the research can be summarized in the following points:

1-The importance of the strategy of analyzing the root causes in teaching physics, which may contribute to raising the academic achievement of students and the dimensions of concurrent thinking

2- The possibility of benefiting from the concurrent thinking test prepared by the researcher to help educators and physics teachers to measure this aspect for research purposes.

3- The importance of concurrent thinking lies in enhancing the ability of students to process multiple information efficiently, which contributes to raising their academic achievement, and developing their cognitive skills

4-The research targeted the preparatory stage, especially the fourth grade scientific, because students of this stage need to organize their scientific affairs and teach them flexible teaching strategies away from memorization and indoctrination (root cause analysis strategy)

Third: The Amis of Research:

The current research aims to identify (the effectiveness of the strategy of analyzing the root causes in the achievement of physics among fourth grade students)

Fourth: The hypotheses of the research

For the purpose of achieving the goal of the research, the researchers formulated the following null hypothesis:

There is no statistically significant difference at the level of (0.05) between the average scores of the experimental group students who will study using the root causes analysis strategy) and the average scores of the control group students who will study in the usual way and concurrent thinking in physics.

Fifth: Limitation of the Research

The current research is determined by:

1. Human limits: Fourth grade middle school students for secondary and preparatory schools (morning) of the General Directorate of Al-Qadisiyah

2.Spatial boundaries: Al-Ayat Secondary School of the Directorate of Education of Al-Qadisiyah

3.Time limits: the second semester of the academic year 2024.-2025

4.Cognitive limits: Academic materialism The last four chapters of the physics book for the fourth grade of middle school edition 2023

Sixth: The Defining of Terms

First: The Effectiveness can be defined as

A. (Dives, 2014) as: the magnitude of the effect produced by the independent variable in the dependent variable(Dives, 2014:26).

Second: The RCA strategy defined by

A. (Ambo Saidi et al. 2019) as (a strategy based on interaction and identification of problems and their solution, and consists of a long series of relationships that link results to causes, and can be represented by several methods such as the tree (Ambo Saidi et al. 216, 2019)

Procedural definition: A strategy adopted by the researcher in teaching physics, which focuses on identifying the underlying causes Physical problems and results And solutions through the use of the tree method .and measured impact through the achievement test in physics and the grades obtained by the students of the experimental and control groups.

Third: Concurrent thinking

defined by:

1-(Abdeen (2016): A new style of thinking patterns, which aims mainly to re-perceive the individual for himconcurrent, his abilities and potentials, through the optimal investment to employ the capabilities and energies of the individual, and he is looking at the possibility of practicing more than one mental activity at the same time, and doing more than one conscious mental process at the same time , (Abdeen,2016:53).

The researcher agrees with the definition of Abdeen (2016) as it fits with the objectives of her research

procedural definition: It is a mental activity that requires the individual to store the largest number of information and process it during a specific period of time, and it is measured by the total degree obtained by students in the experimental and control groups when answering the (scale - test) prepared for this purpose

Chapter II

Theoretical framework and previous studies

First: The strategy of root cause analysis

The idea of this strategy is based on interaction, identification and solution of problems, and consists of a series of relationships that link the result to the cause (Ambo Saidi at all 2019: 216) (Zamanzadeh et al., 2004) defines root cause analysis: It is an analytical tool that aims to improve performance and identify the underlying causes and problems of errors in order to reduce their recurrence, which enhances the sustainability of solutions and provides a more efficient and productive work environment.

Steps of this strategy as mentioned by (Ambo Saidi at all, 2019)

1- Feeling the problem: The first crucial step that lays the foundation for the analysis of the whole cause is to recognize an obstacle or obstacle that prevents reaching the specified goal (Al-Nabhan, 2010: 183)

2- Identifying the problem This is done using the shape of the tree: which means describing it accurately, allowing us to draw its boundaries and what distinguishes it from others (Al-Nabhan, 2010:183), this is done in a concise manner that clearly defines the problem

3- Data collection related to the problem: the extent to which the individual identifies the best available sources of information and data collection in the field related to the problem (Al-Nabhan,2010:183), through data collection and analysis, and here the causative factor is identified from the direct contributing factors and the underlying root cause,

4- Root causes analysis: The basic and important step in the strategy is to identify the individual on the basic elements of the problem and exclude the elements that are not included in the problem (Al-Nabhan,2010 : 183)after analyzing the data and collecting the causes associated with the problem, the main root cause of the problem is determined, and here the causes are analyzed through a tree

5-Proposing solutions: distinguishing the individual and identifying a number of proposed hypotheses to solve the problem (Al-Nabhan2010:183) once the root causes are identified, this stage begins to propose solutions or treatments for the problem.

6- Ensuring the validity of the solution by studying the solutions A proposed study in force: The solution is familiar and clear, so it is adopted and may be a possibility of several possible alternatives, so the comparison between them is based on criteria we determine (Al-Nabhan, 2010:183), represented in implementing the solution and making sure that the problem is fully solved (Ambo Saidi at all, 2019: 216)

Second: Concurrent -thinking

Concurrent -thinking - as it was dealt with in the theory of concurrent thinking (ABDEEN ,2014) The strength of the brain rises with a new type of thinking that we can invite in concurrent thinking, i.e. thinking more than one thing in one, as concurrent thinking is a new model of thinking that mainly aims to restore the per capita perception of himconcurrent, his capabilities and capabilities, through the optimal investment to employ the capabilities and energies of the individual, and he is looking at the possibility of practicing more than a mental and conscious activity at the same time and doing more than the process of mental and consciously Vertical Thinking (which depends on successive sequences and steps) and Lateral Thinking. (, Abdeen 2014, p1005))

Dimensions of concurrent thinking:

a-storage capacity: the ability to increase the space in which information is stored and processed together,

2- Processing speed: the ability to increase the speed of the individual in the perception, assimilation and use of information to complete the mental task (Abdeen, 2016 p43)

To know the relationship between these dimensions, recent studies in cognitive psychology indicated that concurrent thinking depends on a triple interaction between storage capacity in working memory, and the speed of mental processing, This interaction enables the individual to

retrieve previously acquired information and process it quickly and efficiently in new cognitive situations.

Chapter III

Research Procedures:

First: Experimental Design:

The researchers adopted the experimental design with partial control, which is the design of the two equivalent groups with the appropriate post-test for research purposes, as the strategy of analyzing the root causes represent the independent variable in the experiment, and represent the concurrent thinking of the dependent variable, as the following table:

Table (1) shows the experimental design adopted in the research (prepared by the researchers)

Group	**Valence**	**Independent variable**	**Measure the dependent variable**
Experimental	**Chronological age calculated in months** **IQ test (Otis Lennon)** **Concurrent thinking**	**Teaching with the strategy of root cause analysis)**	**Concurrent thinking**
Control		**Teaching according to the usual method**	

Second: - Research Community:

As the current research community consisted of all fourth grade scientific students for the academic year (2024-2025) in the preparatory and secondary schools, which numbered (34) schools, affiliated to the Diwaniyah Governorate, according to the annual statistics of the Planning Department of the General Directorate of Education of Al-Qadisiyah, a secondary school (mechanisms for girls) was selected Two divisions were selected by random draw to represent the two research groups (experimental and control), Where the students of Division (B) were selected to represent the experimental group that will study physics according to the strategy of analyzing the root causes and the selection of students of Division (A) to represent the control group that will be taught in the usual way, and the number of students in the two groups reached (66) students.

Third: Control procedures:

In order to control these factors, the researchers divided them into:

a) Variables associated with the research community (internal integrity of the research design): The researcher was rewarded with a number of variables, which are according to the following table

Variable	The Collection	Sample size	Arithmetic mean	Standard deviation	Degree freedom	T-value		Significance level
						Calculated	Tabular	
Previous Information Test	Experimental	33	10.79	2.67	64	0.088	2	Not significant
	Control	33	10.73	2.94				
IQ Test	Experimental	33	26.70	5.68	64	0.825	2	Not significant
	Control	33	25.67	.4.39				

Concurrent Thinking	Experimental	33	30.70	4.98	64	1.921	2	Not significant
	Control	33	32.94	4.49				

Table (2): Research variables are rewarded

Fourth: Research Tool

Concurrent thinking:

Where the researcher relied on the following dimensions:

-The first dimension: the scale of concurrent thinking (storage capacity)

-The second dimension: the test of concurrent thinking (processing speed)

First: the scale of concurrent thinking (storage capacity):

In order to achieve the second goal of the research, which requires building a scale of concurrent thinking through the following steps:

a. Determining the goal of the scale: The current scale aims to measure the level of possession of fourth grade students Scientific dimensions of concurrent thinking after exposure to Independent variable.

b. Determining the dimensions of concurrent thinking: In light of the definition and what was stated in the research literature for the current research, the researcher relied on the classification of (Abdeen,2016) in her research and in a way that suits the research sample according to the questionnaire presented to the experts in Appendix No. (8).

c-The Development of concurrent thinking paragraphs: The researcher formulated the paragraphs of the concurrent thinking scale (storage capacity) in its initial form, as the scale included (20) paragraphs initially, noting that the answer alternatives are five with weights (1,2,3,4,5) for the paragraph, and according to the total degree of each respondent by collecting scores on the paragraphs of the scale, appendix (13-a) explains that.

D- Statistical characteristics of the scale: The researcher extracted these characteristics of the concurrent thinking scale through the following:

***Honesty: The sincerity of the scale was conducted through the following:**

1.Virtual honesty: The researcher verified the sincerity of the concurrent thinking scale by presenting it to a group of arbitrators specialized in the methods of teaching physics, and specialists in measurement and evaluation Appendix (8), it has been accepted paragraphs that most of the arbitrators agreed upon if he obtained an agreement rate (80%), and the output of the scale of concurrent thinking in its final form consisting of (20) paragraphs, followed by the answer form as stated in Appendix (13_a) and table (18) Shows the percentage of agreement of the arbitrators on the paragraphs of the scale.

2. Exploratory application of the scale: The exploratory scale of concurrent thinking (storage capacity) was applied in two stages:

• The first exploratory sample of the scale

The scale of concurrent thinking (storage capacity) was applied to the first exploratory sample on a sample of (30) students and it turned out that all paragraphs are clear and understandable, and the time taken was (40) minutes.

• The second exploratory sample of the scale

a - Applied the scale of concurrent thinking (storage capacity) on the second exploratory sample consisting of (100) the researcher used, and the goal of the exploratory application was to carry out statistical analysis of the paragraphs of the scale.

3. Statistical analysis of the paragraphs of concurrent thinking:

After correcting the answers of the second survey sample, the scale, then arranged the students" grades in descending order and took (27%) of the highest scores to represent the upper group, and (27%) of the lowest scores to represent the group, the scale of concurrent thinking (storage capacity) in order to calculate the following:

a - The discriminatory power of the scale of concurrent thinking (storage capacity): The researcher followed the method of the two extreme groups to find out the discriminatory power, then the

researcher applied the T-test to find out the significance of the difference between the two upper peripheral groups and the minimum for each paragraph of the scale, it has found that the calculated T values for the paragraphs of the scale statistically significant as it ranges between (2.03-3.96), which is higher than the tabular T value of (2) at the level of significance (0.05) and the degree of freedom (52) and this indicates that the ability of paragraphs to distinguish between respondents to detect individual differences between them and the appendix (14-a) illustrates this.

b - Internal consistency: assumes that the total degree is a criterion for honesty, if the value of the correlation coefficient ranges between (0-1.00) The researcher used Pearson"s correlation coefficient to extract the correlation coefficients of each paragraph with the total degree, the scale of concurrent thinking (storage capacity), in the second exploratory sample, and the correlation coefficients ranged between (0.344 – 0.615), as shown in Table (16)

It should be noted that all correlation coefficients were acceptable and statistically significant at the level of significance (0.05), after comparing them The tabular value of the correlation coefficient and the degree of freedom (198) is equal to (0.096) and therefore none of these paragraphs have been deleted.

c-The researcher verified the stability of the scale, to find the stability of the scale of concurrent thinking (storage capacity) The researcher used the second exploratory sample consisting of (100) students, the results showed that the value of the stability coefficient (0.91) Appendix (14-b) and Cronbach points out that if the stability coefficient (0.70) or more, it is a good indicator of the stability of the scale (Essawi, 1985: 59).

d- Final Form of the Scale: The scale of concurrent thinking (storage capacity) in its final form consists of (20) items as in Appendix No. (5), and the total score ranged between (100-20).

Second: Concurrent Thinking Test (Speed of Processing)

a. Determine the goal of the test: The current test aims to measure the level of possession of fourth grade students scientific dimensions of concurrent thinking after exposure to the independent variable.

b. Formulation of concurrent thinking paragraphs: The researcher formulated the paragraphs of the concurrent thinking test (processing speed), as the test included (20) items.

C. Statistical characteristics of the test: The researcher extracted these characteristics of the test concurrent thinking (processing speed) through the following:

Honesty: The researcher extracted honesty in order to verify the extent to which the scale achieves the goal for which the scale was developed, and the validity of the scale was conducted through the following:

1-Virtual honesty: The researcher verified the sincerity of concurrent thinking by presenting it to a group of arbitrators specialized in methods of teaching physics, and specialists in measurement and evaluation. Appendix (8), and it was accepted by (80%) and the output of the concurrent thinking test (processing speed), in its final form, consists of (20) items, followed by the answer form as stated in Appendix (13-A) and Table (19) shows the percentage of arbitrators" agreement on the paragraphs of the scale.

2-Exploratory application: The exploratory test of concurrent thinking (processing speed) was applied in two stages:

•The first exploratory sample:

The concurrent thinking test (processing speed) was applied to the sample of (30) and it turned out that all paragraphs are clear and understandable, and the time taken was (25) minutes.

•The second exploratory sample:

The researcher applied the concurrent thinking test (processing speed) to the second exploratory sample consisting of (100) and the goal of the exploratory application was to carry out statistical analysis of the paragraphs of the scale.

3-. **Statistical analysis of concurrent thinking paragraphs:**

After correcting the answers of the second survey sample for the concurrent thinking test (processing speed), then arrange the students" grades in descending order and take (27%) of the

highest scores to represent the highest group, and (27%) of the lowest scores to represent the lowest group in the concurrent thinking test (processing speed) in order to calculate the following:
• Paragraph difficulty coefficient for the Statistical Analysis of Test Items: The researcher applied a special equation to calculate the coefficient of difficulty on each paragraph of the test paragraphs concurrent thinking and all of them were acceptable as they range between (0.28-0.59).Appendix No. (13-s)
•Coefficient of excellence paragraphs for the test Item Difficulty Index:
"The researcher used the equation of the coefficient of discrimination of paragraphs, all of which were acceptable, ranging between (0.41-0.78). Appendix No. (13-W)"
•"Effectiveness of Distractors": "The effectiveness of the wrong alternatives was calculated and the researcher found that it ranges between (-0.44-0.04). Appendix No. (13-W)"
4-. **Internal consistency**: "It assumes that the total degree is a criterion for honesty, if the value of the correlation coefficient ranges between (0-1.00) The researcher used the Pearson correlation coefficient to extract the correlation coefficients of each paragraph with the total score, for the test of concurrent thinking (processing speed) in the second exploratory sample, and the correlation coefficients of the concurrent thinking test (processing speed) ranged Paragraph relationship to the total degree: The correlation coefficients of the paragraph with the total score ranged between (0.341 – 0.693). As shown in Table (20)"
"It should be noted that all correlation coefficients were of acceptable degrees and statistically significant at the level of significance (0.05), after comparing them with the tabular value of the correlation coefficient and with a degree of freedom (198) equal to (0.096) and therefore none of these paragraphs were deleted".

5-"Stability of the scale": "The researcher verified the stability of the concurrent thinking test (processing speed) through the following":

"The stability coefficient of the concurrent thinking test (processing speed) was calculated in two ways":
1-Half segmentation:
"The stability coefficient between the two halves of the test (odd and even paragraphs) was extracted using the Pearson correlation coefficient between the scores of the two halves of the test, it reached (0.785) and when corrected by the Spearman-Brown equation, it reached (0.880), which is a good stability coefficient that can be trusted, Appendix (13-G)".
2-Cuder-Richardson-20 equation:
"This equation was used because the test paragraphs are made up of alternatives (multiple choice) and it was found that it is equal to (0.85) and this indicates that the test has a high degree of stability, supplement (13-d)".
. **Final Form of the Scale**: The concurrent thinking test (processing speed) in its final form consists of (20) items as in Appendix No. (17), and the total score of the test ranged between (20-0).
"Final Form of the Scale": "The final concurrent thinking in its final form consists of (40) paragraphs as in Appendix No. (13-b), and the total score ranged between (120-20) and Table (3) shows the distribution of paragraphs on the dimensions of concurrent thinking in its final form".
Table (21):"Shows the number of paragraphs of concurrent thinking in its final form"

Sequence	Dimension	Number of ragraphs
1	First Dimension (Scale)	20
2	Second Dimension (Test)	20
Total		40

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Chapter IV

First :RESULTS PRESENTATION:

Presentation of results related to concurrent thinking:

"For the purpose of verifying the validity of the null hypothesis, which states that":

"There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who studied using the root causes analysis strategy L and the average scores of the control group students studied in the usual way in concurrent thinking in physics"

"The researcher used the T-test to find out the significance of the differences Between the two groups in the scale of concurrent thinking applied to the students of the two groups, and after correcting the researcher their papers, deliberately calculated the arithmetic mean and standard deviation for each group and find the value of (t-test) as in Table (24) and graph (17)".

Table (25)"T-test results for the scores of the experimental and control groups in the concurrent thinking scale for fourth grade students"

Sequence	The llection	Number female dents	Arithmetic an	Standard viation	Degree freedom	T-value		Statistical nificance at 5
						Calculated	Tabular	
1	Experimental	33	38.52	3.97	64	3.828	2	function
2	Adjuster	33	34.42	.4.68				

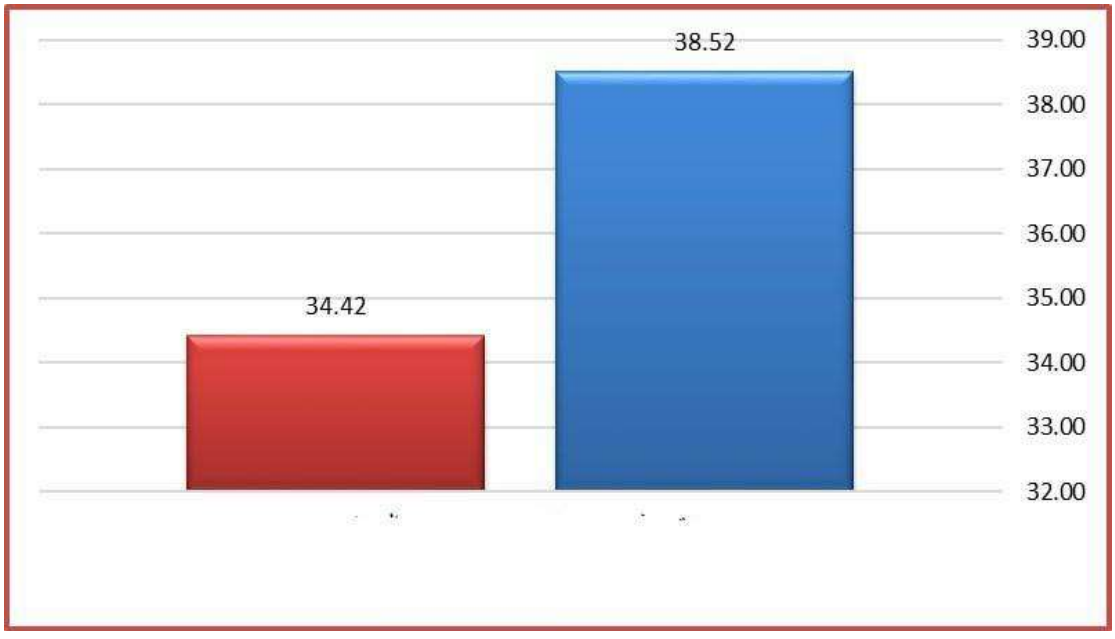

Diagram (1) "shows the arithmetic average of the scores of the two groups in their concurrent thinking"

"Thus, reject the first null hypothesis and accept the alternative, and this means the superiority of the students of the experimental group who studied using (strategy analysis of root causes) on the students of the control group who studied in the usual way in their concurrent thinking, as the researcher used the equation of the square of ETA (η2) in extracting the effectiveness or size of the effect of the independent variable in the scale of concurrent thinking, and to indicate the

Mean Scores of the Students in the Experimental and Control Groups

size of the impact of the independent variable (strategy of analyzing root causes) in the dependent variable (concurrent thinking) The researcher used the scale of the square of ETA (η2)".

Table(26)"The value of (η^2) and its corresponding value of (d) and the magnitude of the effect size in concurrent thinking in learning"

Independent riable	Dependent riable	T ue	Degree of edom	ETA lue(η^2)	value	Impact e
Root cause analysis ategy	Concurrent nking	**3.828**	**62**	**0.19**	**0.96**	**big**

"By extracting the value (d) that reflects the size of the effect, which reached (0.96), and the value (η^2), which equals (0.19), which is a large value when interpreted in relation to the independent variable (root cause analysis strategy) in the dependent variable (concurrent thinking), according to the gradation established by (Cohen, 1988), which sees that the size of the effect is large when it is (0.80) or more, and Table (22)".

Second: Interpretation of the results

"The results showed the superiority of the experimental group that studied using the strategy of analyzing the root causes over the control group that was studied in the usual way of concurrent thinking, as the researcher attributed this result to":

This result indicates that the extraction of a concept or a physical law requires the ability to link different concepts and move between these concepts repeatedly, and this strategy adopts the principles of constructivist theory, as it helps students in the search for alternative, creative and permanent solutions, and organize their thinking to confront Difficult issues, which may be an obstacle for them, by choosing alternative and non-traditional solutions to these issues, and adapting to them easily and easily to make their decisions to solve problems in scientific ways and ensure that the solution is correct and accurate to reach the desired results and thus improved their concurrent thinking

THIRD:CONCLUSIONS

"In light of the results of the research, the following conclusions can be drawn":

"The strategy of analyzing the root causes contributed to increasing the concurrent thinking of fourth grade scientific students".

Fourth: Recommendations

1- "Include concurrent thinking skills in the preparatory school curricula to improve the thinking of middle school students".

2- "Attention by physics teachers in the daily study plans to teach middle school students according to the strategy of analyzing the root causes"

Fifth: Suggestions

1.The effectiveness of the strategy of analyzing the root causes in the collection of chemistry for the second intermediate grade.

2-The level of concurrent thinking of middle school students in physics

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